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Has Air-Cushion Landing Gear

Bell Firm Makes History With Special-Type Plane

David W. Howe T. Desmond Earl

Pioneers in air travel pose with Bell's new ACLG

New Phrase Born With Landing Gear

"Bag down and Inflated." With these words Bell test pilot David W. Howe established a new phrase in avaiation lexicon as he prepared for the first landing of a plane equipped with an air cushion landing gear system.

That phrase someday may join "gear down and locked" as the standard airplane-to-tower communication just before landing. After his flight, Howe said it was impossible to tell just when the air cushion support for the craft left off.

He was mainly referring to the takeoff when the plane gained air speed and the wings took over support of the craft.

He described both the landing and takeoff as "smooth as silk" but added the main difference was that he did not get the customary feel of the whells thumping along the runway.

Howe, a native of Pennsylvania, who flew with both the Royal Canadian Air Force and the U.S. Army Air Force in World War II, joined Bell 15 years ago. Since then he has been involved in many of Bell's major projects.

In the 1950s he became the world's first pilot to fly a vertical takeoff plane, a test vehicle designed and built by Bell. He also was project pilot for the SKMR-1 Hydroskimmer, the 30-ton air cushion vehicle built by Bell for the Navy.

The inventors of the Air Cushion Landing System, T. Desmond Earl and Wilfred J. Eggington are both natives of England.

Both men have extensive experience in aerodynamics and and in recent years have been closely associated with the development of air-cushion vehicles. Eggington, who is chief of Bell's air cushion design technology, joined the company in 1963.

Earl has been associated with Bell since 1961 when he conducted performance studies on the SKMR-1 air cushion vehicle. He currently is technical director and program manager for the Air Cushion Landing Gear program.

By WILLIAM F. CALLAHAN

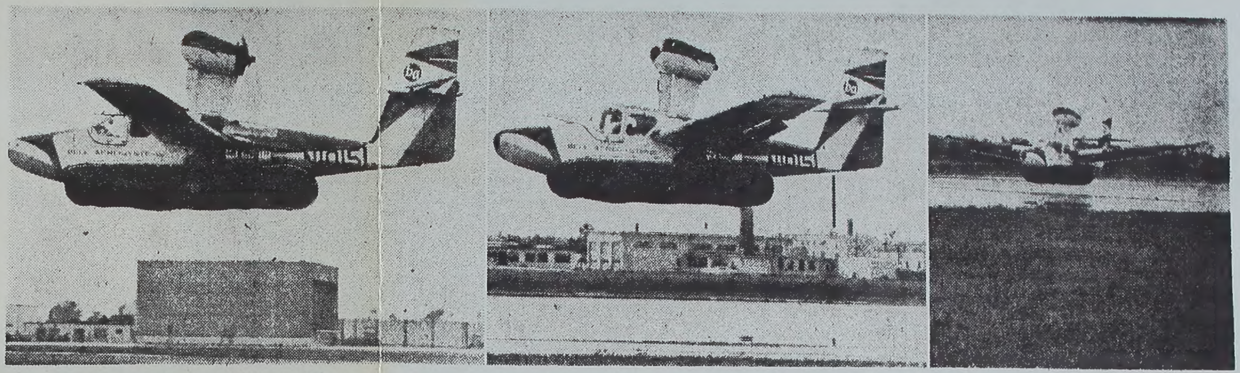
More aviation history has been made on the Niagara Frontier as Textron's Bell Aerosystems Co. successfully flew the world's first airplane equipped with an air-cushion landing gear system instead of the conventional gear and wheels.

The historic take off and landing took place on Friday Aug. 4 at the Niagara Falls International Airport adjacent to Bell's huge Town of Wheatfield plant. Details and pictures of the initial flight were made public by the company late Saturday.

Although still in the experimental stage, the flight proved that the concept of using a cushion of air for landing and taking off is feasible and may have widespread effect on airplanes of the future.

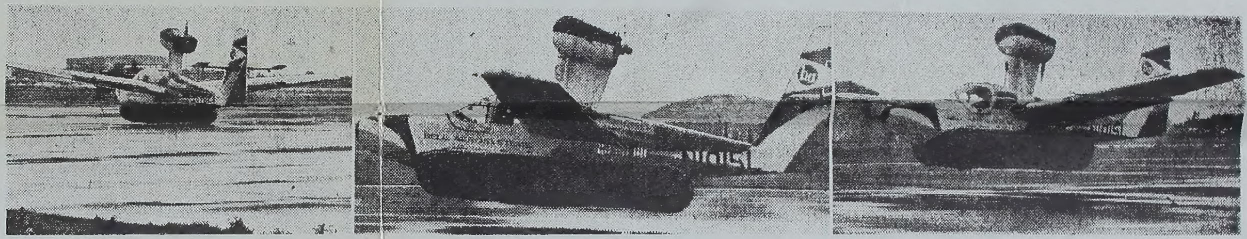
The flight climaxed a company-financed research program that began on Dec. 1, 1963. A small LA4 "Lake" amphibian airplane was used for the initial testing. The plane was purchased by Bell and modified by their engineers who equipped it with the air-cushion system.

Veteran Bell test pilot David W. Howe, who also has extensive experience operating Bell's renowned water air-cushioned vehicles, was at the controls for the first flight.



History-making aircraft with an air cushion landing gear system takes off from strip at Niagara Falls International Airport

. . . in flight, the air cushion is deflated



Landing of the ACLG is accomplished by transferring craft's support from the wings to the air cushion gear beneath

. . . can be used on water, ice, mud or snow as well

Pilot Makes First Air-Cushioned Landing

He reported no difficulties as the plane moved down the runway on its cushion of air and became airborne. He circled the field and came in for the first air-cushioned landing.

He reported that the plane behaved much as it would with wheels and added that the takeoff and landing were "smooth as silk."

The system has been designated by Bell as the Air Cushion Landing Gear (ACLG). When the cushion bag is inflated it looks like a large, black, doughnut wrapped around the plane's undercarriage.

When the plane is in flight, the bag is deflated and hugs tightly and aerodynamically to the aircraft. T. Desmond Earl, project director and co-inventor of the ACLG, said the deflated bag does not create any drag on the aircraft in flight.

He explained that the air cushion bag is activated by a fan that Bell engineers installed in the hollow rear fuselage of the airplane.

To prepare for landing, the pilot starts a small, four-cylinder engine that powers the axial fan. When he is ready to inflate the bag, he pulls a lever to "inflate" position.

Special-Type Lever Controls Described

The "inflate-deflate" lever controls two sets of louvers in the airplane's fuselage. In the "inflate position, louvers leading to the cushion are opened and louvers on the side of the fuselage are closed.

When the lever is in "deflate position," the louvers reverse their positions. The side louvers also are designed to give the airplane forward thrust when the ACLG is in "deflate" mode with the fan engine on.

The most distinguishing feature of the system is the landing gear bag. When it is inflated, air from the fan engine escapes through hundreds of nozzles that circle the bags underside.

These jets of air feed inward toward the "hole" of the ACLG "doughnut," producing an air cushion under the aircraft that holds the plane off the ground.

Bell developed a special material for the bag. It consists of layers of nylon cloth sandwiched between layers of rubber. This material stretches easily to three times its width, but cannot be stretched lengthwise at all.

Bell Has a Patent On the ACGL Concept

In landing with ACLG, the plane's forward speed is checked by reversing the propeller pitch. For final braking, the bag's rubber ribbed tread is brought into contact with the ground by a braking control.

Bell has patented the ACLG concept. Co-inventor with Earl, and also named in the patent, is Wilfred J. Eggington, chief of Bell's air cushion vehicle design technology.

One of the best features of the ACLG is that it does not need a hard-surfaced runway," Earl said. "Because the bag is flexible, it conforms to ground contours and can pass over obstacles," he said.

"In an emergency," he said, "bulldozers could rough-grade an airstrip and giant cargo planes fitted with the air cushion system could begin landing immediately."

He also pointed out that the weight of the plane is spread out over the relatively large area covered by the bag. Because of this, Earl said, only a small amount of air pressure is needed to hold the craft off the ground.

In the test plane used by Bell, the air pressure totals 50 pounds per square foot, or less than half a pound per square inch. In contrast, a wheeled airplane puts all its weight on the small surface where the tires touch the runway.

Therefore, an airplane equipped with the air cushion landing system can use open water, ice, snow, swampland, sand or dirt for most runways. Only its actual debarking, service and terminal areas would have to be surfaced with concrete for use by service vehicles.

Bell Will Continue To Modify ACGL Plane

Earl said Bell will continue to modify its ACLG airplane with additional flights planned for later this year. The initial plane is a test bed intended to prove the air cushion landing gear concept and lead the way toward its application in military, commercial and cargo airplanes.

Last year Bell received a $99,000 contract from the Flight Dynamics Laboratory at Wright-Patterson Air Force Base to do wind-tunnel tests on ACLG models. More recently, Bell received a $98,700 contract from Wright-Patterson to build a ground test model to study the possible use of the ACLG on a C119 "Flying Boxcar" cargo airplane.

Besides its pioneer work with air cushion vehicles, Bell also has been an innovator in landing gear technology. The company's first airplane, the 1935 Bell Airacuda, was equipped with a tricycle landing gear, an innovation which eventually became the accepted design for all aircraft.

Air-Cushion Plane Historic

The air-cushion landing gear plane is the latest in a series of innovations with which Bell Aerosystems and its predecessor Bell Aircraft Corp. have made history on the Niagara Frontier.

In 1942, Bell developed the nation's first jet airplane, the P59 Airacomet. Five years later, supersonic air travel was made possible by the development of the X-1 rocket research aircraft, the first to fly faster than sound.

In the 1950s, Bell designed and built the first jet-propelled vertical takeoff and landing aircraft. In the space age, it has developed the famous Agena Engine and the world's only rocket belt to propel man in the air.

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